

REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claim 16-19 and 22-40 are presently active in this case, Claims 16, 36 and 39 amended by way of the present amendment.

In the outstanding Office Action, Claims 16 and 39 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,350,682 to Liao in view of U.S. Patent No. 6,903,023 to Wise et al.; Claims 17-19, 22, 36-38 and 40 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Liao in view of Wise and further in view of U.S. Patent No. 6,500,773 to Gaillard et al.

First, Applicants wish to thank Examiner Luu for the October 26, 2006 personal interview at which time the outstanding issues in this case were discussed. During the discussion, Applicants presented amendments and arguments substantially as indicated in this response. Agreement was reached that the amendments contained herein overcome the outstanding rejection, but further search and consideration is necessary.

Turning now to the merits, in order to expedite issuance of a patent in this case, Applicants have amended independent Claim 16 to clarify the patentable distinctions of the present invention over the cited references. Specifically, Applicants Claim 16 as amended recites a process of forming an integrated circuit structure including forming a layer of dielectric material on a substrate, the layer of dielectric material including silicon dioxide or a dielectric material having a nominal dielectric constant value less than the dielectric constant of SiO₂. A hard mask layer is formed on the dielectric layer, the hard mask layer comprising a nitride, a carbide, a refractory metal, or a refractory metal nitride, and forming a layer of tunable etch resistant anti-reflective (TERA) material on the hard mask layer. Also recited is forming a dual damascene structure for a metal interconnect, the dual damascene structure

having a bottom opening extending to a surface of the substrate, and a top opening in communication with and wider than the bottom opening and extending to the layer of TERA material, wherein the layer of TERA material is etched to a width of the top opening and used as at least one of a top hard mask, a tunable anti-reflective coating, a chemical mechanical polishing (CMP) stop layer, or a sacrificial layer.

Thus, as discussed in the October 26 interview, Applicants have amended Claim 16 to recite forming of a hard mask layer and a TERA layer. This limitation is supported by at least the figures of the original application, which show use of both a hard mask and a TERA layer. Further, Claim 16 has been amended to recite the material composition of the dielectric layer and the hard mask layer in order to clarify the order in which these layers are formed. Specifically, Claim 16 recites that that dielectric material is silicon dioxide or has a nominal dielectric constant value less than SiO_2 . Support for this limitation is provided in Applicants' original specification at paragraph [0026]. Claim 16 also recites that the hard mask layer comprises a nitride, a carbide, a refractory metal or a refractory metal nitride. Support for this limitation is provided in Applicants' specification at paragraph [0030]. Finally, Claim 16 has been amended to recite the functionality of the TERA layer when a hard mask is used in addition to the TERA layer. Support for this feature is provided in Applicants' specification as originally filed at least at paragraph [0025]. Thus, Applicants' amendments to Claim 16 do not raise an issue of new matter.

In contrast, to Claim 16, the cited references do not disclose forming both a hard mask and a TERA layer in an integrated circuit. As discussed in the October 26 interview, Liao discloses forming a dual damascene structure using only a hard mask without any TERA layer. While the secondary reference to Wise et al. discloses a TERA layer, the TERA layer is not used to form a dual damascene structure and is not used in combination with a hard

mask layer. Thus, Liao and Wise do not disclose use of both a hard mask layer and a TERA layer as now required by Applicants' amended Claim 16.

Further, as also discussed in the interview, one of ordinary skill in the art would not be motivated to modify the structure of Liao and Wise to include both the hard mask and TERA layer. As noted in Applicants' specification, it is the present inventors who discovered that it is beneficial to use a TERA film in forming a dual damascene back end of line (BEOL) structure. There is no hint or suggestion in either of Liao or Wise to use a TERA film in addition to the hard mask of Wise in order to form the dual damascene structure of Wise et al. At best, and as acknowledged by the outstanding Office Action, one would substitute the hard mask layer of Liao with the TERA layer of Wise et al. There is no suggestion in the cited references to include both of these layers.

Even assuming that Liao and Wise et al. could be combined, these references would not disclose the structure recited in Claim 16. As noted above, Applicants' Claim 16 recites the material composition of the dielectric and hard mask in order to clarify the formation of these layers. Assuming that the combination of Liao et al. and Wise et al. disclose the recited dielectric layer, hard mask layer, and TERA layer individually, these references do not disclose forming a layer of dielectric material (e.g. SiO₂), forming a hard mask layer (e.g. nitride layer) on the dielectric layer and forming a TERA layer on the hard mask layer as recited in Applicants' independent Claim 16.

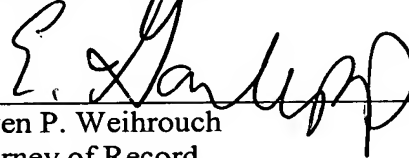
Finally, the Gaillard et al. reference cannot correct the deficiencies of Liao et al. and Wise et al. As previously argued on record in this case, Gaillard et al. does not disclose use of a TERA layer to form a dual damascene structure or that the TERA layer is etched to the width of a top opening of the dual damascene structure. Moreover, Gaillard et al. is cited as a secondary reference for its teaching of the photoresist layer in relation to the TERA layer.

For the reasons discussed above, Applicants' Claim 16, as amended, patentably defines over the cited references. As Claim 16 defines over the cited references, the remaining pending claims depending from Claim 16 also patentably define over the cited references.

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application and the present application is believed to be in condition for formal allowance. An early and favorable action is therefore respectfully requested.

Respectfully submitted,

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